REMARKS

Claims 14-18, 21 and 22 are pending in the present application. Claims 14, 15, 17 and 18 are herein amended. No new matter has been presented.

The amendments to the claims are supported in the specification at, *e.g.*, paragraphs 11 and 16 of the published application (US 2008/35842) and Figs. 6 and 10.

Claim Objections

Claim 15 was objected to because the limitation "said set of trapping states" lacks an antecedent. Claim 15 has been amended for clarification.

Withdrawal of the claim objection is requested.

Claim Rejections – 35 U.S.C. § 112

Claim 14 was rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Office Action stated that the limitation "DC levels applied on the electrode" is vague and indefinite. Claim 14 has been amended for clarification.

Withdrawal of the § 112 rejection is requested.

Claim Rejections – 35 U.S.C. § 103

Claims 14-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Frazen** (US 5,763,878) in view of **Ding** (US 6,900,433); and claims 21 and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Frazen** in view of **Ding**, and further in view of **Okumura** (US 2003/0066958).

Favorable reconsideration is requested.

Franzen is described in the present specification as the conventional art. The present specification states:

> The method [of Franzen] suggests that the RF is completely switched off upon extraction and replaced by certain combination of DC voltages on the electrodes of the trap. The patent [Franzen] does not teach how to switch off the RF field although it is mentioned as a difficult practical problem. The optimum voltage configuration on the electrodes and the timing of extraction are also not described.

(Specification, paragraph [0007].) The present invention intends to overcome these disadvantages of Franzen.

Franzen traps ions in the ion trap by applying RF voltages on the electrodes of the ion trap. (Col.7, lines 53-55). Claim 14 recites trapping ions in the ion trap by applying trapping voltages having waveform created by fast switching of the application on electrodes of the ion trap between discrete positive and negative DC levels in short switching period. The fast switching of the application on the electrodes are shown in the attached Explanation Drawing. Present claim 14 does not recite using RF voltages to trap ions because RF voltages cause various problems. (See paragraph [0003].) Thus, as disclosed in the Office Action, the trapping step of present claim 14 is not disclosed in Frazen. (Office Action, page 4.)

(1) Applicants respectfully submit that Franzen in view of Ding does not teach or suggest:

> extracting the trapped ions in said ion trap to said time-of-flight mass spectrometer by applying extracting levels on the electrodes of said ion trap under conditions, where at least one pair of the electrodes are kept at a constant value of positive or negative DC level over a period which is longer than said switching period

as recited in amended claim 14.

The Office Action cited Franzen at col. 8, lines 10-30 for teaching this feature. (Office Action, pages 3-4.) Franzen discloses two embodiments of extracting the ions from the ion trap (Figs. 3 and 4). In Fig. 3, Franzen stops the storage RF voltages in the zero sweep and applies double acceleration potential to the Repeller 21. Franzen also applies high voltages on Pole Rods 22-27 so that an approximately uniform electrical acceleration field can be produced. The application of extracting voltages on the Repeller 21 is essential for the ejection of the ions in Fig. 3. However, Franzen states that, "Switching of the pole rods to the above high DC voltage potentials is technically not easy, therefore it is practical to select a different arrangement in which only the RF voltage is stopped in the zero sweep to outpulse the ions. Such an arrangement is shown in Fig. 4." Fig. 4 shows an arrangement of the two pole rods pointing to the Drawing Diaphragm 29 having a wider space so that an outside field can penetrate more easily. (Col. 8, lines 10-30.) The ions are extracted by only stopping the RF voltages on the electrodes of the ion trap in the zero sweep. In Franzen, the outside field extracts the ions as shown in Fig. 4. However, Franzen does not apply extracting voltages on the electrodes of the ion trap as recited in claim 14.

Claim 14 recites extracting the ions by applying extracting levels on the electrodes of the ion trap. The present invention needs neither a repeller nor a drawing diaphragm to extract the ions. Additionally, claim 14 recites applying extracting levels under the conditions, where at least one pair of the electrodes are kept at a constant value of positive or negative DC level over

a period which is longer than the switching period (see the attached Explanation Drawing). Such a condition is not disclosed in Franzen.

Furthermore, although Franzen states that "the storage RF is stopped in the zero sweep," (col. 7, lines 59-6l and col. 8, lines 10-13), stopping RF field is not practically easy because of the huge amount of energy in a 1W resonator. (See specification, paragraph [0007].) Franzen does not mention this problem.

The construction of the electrodes engaged in extracting the trapped ions is also different between Franzen and claim 14. Franzen uses the Drawing Diaphragm 29 positioned outside of the electrodes of the ion trap to extract the trapped ions. (Col. 8, lines 10-30, Fig. 4.) Franzen also uses the Repeller 21 which surrounds the electrodes of the ion trap to extract the trapped ions. (Col, 7, lines 59-61; Figs. 3 and 4.) Thus, Franzen combines the electrodes of the ion trap and other electrodes to extract the trapped ions.

(2) Applicants respectfully submit that it would not have been obvious to combine the teachings of Franzen and Ding.

Ding discloses improving the performance of mass scanning of the ion trap. (Col. 5, lines 32-36.) The invention of Ding relates to a method of using the quadrupole ion trap as a mass spectrometer. Therefore, Ding need not consider the distribution of ion position and ion velocity in the ion trap before ejecting from the ion trap. As the Office Action points out, Ding traps the ions in the ion trap by applying trapping voltages having waveform created by fast switching of the application on electrodes between discrete DC levels. However, it would not have been easy

or obvious for one of ordinary skill in the art to combine the trapping method of Ding in the method of Franzen as discussed below.

The Office Action takes the position that it would have been obvious to one of ordinary skill in the art to use the fast digital switches of Ding in the method of Franzen. (Office Action, page 4.) However, Franzen discloses that "Switching of the pole rods to the above high DC voltage potentials is technically not easy, therefore it is practical to select a different arrangement in which only the RF voltage is stopped in the zero sweep to outpulse the ions. Such an arrangement is shown in Fig. 4 in the form of a distorted quadrupole arrangement." These descriptions suggest that the combination of the fast digital switches of Ding and the method of Franzen is not practical.

(3) Applicants respectfully submit that Franzen in view of Ding does not teach or suggest: "A method of optimizing ion distribution of ion position and velocity and extracting ions from a linear ion trap to time-of-flight mass spectrometer" as recited in amended claim 1.

The present invention as recited in claim 14 intends to optimize ion distribution and velocity in the ion trap in order to improve the performance of TOP mass analysis in terms of resolution and mass accuracy. Neither reference teaches this feature and as stated above, Ding need not consider the distribution of ion position and ion velocity in the ion trap before ejecting from the ion trap.

For at least the foregoing reasons, claims 14-18, 21 and 22 are patentable over the cited references. Accordingly, withdrawal of the rejections of claims 14-18, 21 and 22 is hereby solicited.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP

/Andrew G. Melick/

Andrew G. Melick
Attorney for Applicants
Registration No. 56,868
Telephone: (202) 822-1100
Facsimile: (202) 822-1111

AGM/adp
Attachment: Explanation Drawing